

### SECTION 3. ENGINEERING PROCEDURES FOR OBSTRUCTION EVALUATION (OE) CASES FOR NON-FM BROADCAST

#### 25. NON-FM BC STUDY PROCEDURES.

**a. The initial step is the CIRCLE REPORT.** The search radius varies with the service being investigated. The radii are:

- (1) **Cellular telephone** - 2 nmi
- (2) **Land mobile/microwave** - 12 nmi
- (3) **AM Broadcast** - 3 nmi
- (4) **TV Broadcast** - 10 nmi
- (5) **Other** - as appropriate for the service

**b. After the report has been printed,** review it for FAA facilities within the radii shown in subparagraph a. above. The following are the parameters for concur/non-concur statements.

##### **c. Cellular**

- (1) **If source is greater** than 1 nmi, concur.
- (2) **If source is equal to or less** than 1 nmi, check in/out-of-band levels.
- (3) **If in-band/out-of-band levels are exceeded,** proceed per subparagraph i.

##### **d. AM Broadcast**

- (1) **If source is greater** than 1 nmi, concur.
- (2) **If source is equal to or less** than 1 nmi, check in/out-of-band levels.
- (3) **If in-band/out-of-band levels are exceeded,** proceed per subparagraph i.

##### **e. TV Broadcast**

- (1) **If source is greater** than 10 nmi, concur.
- (2) **If source is equal to or less** than 10 nmi, check in/out-of-band levels.
- (3) **If in-band/out-of-band levels are exceeded,** then:

- (a) **If VHF-TV,** issue a determination of no hazard with conditional statement.

(b) **If UHF-TV** and the problem cannot be corrected by reducing power, lowering the antenna or moving the site, then issue a determination of no hazard with conditional statement.

**f. Microwave**

- (1) **Not in government band**, concur.
- (2) **In government band**, check in/out-of-band levels.
- (3) **If in-band/out-of-band levels are exceeded**, proceed per subparagraph i.

**g. Land mobile**

- (1) **If source is greater** than 12 nmi, concur
- (2) **If source is equal to or less** than 12 nmi, check in/out-of-band levels

(a) **If the out-of-band level** is between -4 to -30 dBm, run the INTERMOD program for 118-137 MHz (COMM receivers) to determine whether there will be IM's which will overlap at the receiver site.

- (b) **If there is no overlap**, concur.
- (c) **If there is overlap**, non-concur.
- (d) **If the level is <sup>3</sup> -4 dBm**, non-concur.

**h. Band levels**

- (1) **In-band** spurious level < -104 dBm - concur
- (2) **In-band** spurious level <sup>3</sup> -104 dBm - concur with comment
- (3) **Out-of-band** radiation level < -4 dBm - concur
- (4) **Out-of-band** radiation level <sup>3</sup> -4 dBm - non-concur

**i. Procedure for AM, cellular and microwave.** Refer to Chapter 8, paragraph 807 of this order for detailed procedures involving AM broadcast and non-broadcast facilities.

**26. A NON-FM BC EXAMPLE.**

**a. The example** is a 60 W Land Mobile transmitter on 155.25 MHz to be located about 200¢ from an FAA ATCT COMM facility. See sample work sheet figure 31.

(1) The **GROUND.WK1 program** was run, which produced in-band radiation level of -65.7 dBm and out-of-band level of -8.6 dBm. This would require a "concur with comment" letter which essentially states FAA concurrence with the installation provided sufficient spurious suppression is installed to assure a level  $< -104$  dBm at the FAA band 118-137 MHz. See figure 32.

# FIGURE 31. SAMPLE NON-FM WORK SHEET

## OBSTRUCTION EVALUATION (OE) WORKSHEET NON-FM

DATE 4-14-93 LOCATION TEST CASE # TEST

COORDINATES: 340516/1170816 ANT MSL 1595'

PROPOSED FREQ 155.25 MHz ERP 0.06 kW ☒ NEW ☐ MODIFIED

Scenerio:

☒ RUN PC CIRCLE REPORT

<input type="checkbox"/> CELLULAR (2 NMI)	<input checked="" type="checkbox"/> LAND MOBILE/MICROWAVE (12 NMI)
<input type="checkbox"/> AM BC (3 NMI)	<input type="checkbox"/> TV BC (10 NMI) (video frequency)
<input type="checkbox"/> OTHER	<input type="checkbox"/> NO FACILITY WITHIN SEARCH RADIUS

### FAA GROUND RECEIVERS

☐ CELLULAR > 1 nmi from facility - CONCUR  
☐ CELLULAR ≤ 1 nmi from facility - check in-band and out-of-band levels  
  
☐ AM BC > 1 nmi from facility - CONCUR  
☐ AM BC ≤ 1 NMI from facility - check in-band and out-of-band levels  
  
☐ TV BC > 10 nmi from facility - CONCUR  
☐ TV BC ≤ 10 nmi from facility - check in-band and out-of-band levels  
  
☐ MICROWAVE - not in government band - CONCUR  
☐ MICROWAVE - in government band - check in-band and out-of-band levels  
  
☐ LAND MOBILE - > 12 nmi - CONCUR  
☒ LAND MOBILE - ≤ 12 nmi - check in-band and out-of-band levels

☒ out-of-band -4 to -30 dBm - run INTERMOD program  
    ☐ intermods within 118-137 MHz band?  
    ☒ no - CONCUR  
    ☐ yes - check in-band and out-of-band levels

### BAND LEVELS

☐ In-band spurious level < -104 dBm - CONCUR  
☒ In-band spurious level ≥ -104 dBm - CONCUR WITH COMMENT  
☐ Out-of-band radiation level < -4 dBm - CONCUR  
☐ Out-of-band radiation level ≥ -4 dBm - NON-CONCUR

### AIRBORNE RECEIVERS

☐ Intermods within 108-137 MHz band?  
    ☐ No - CONCUR  
    ☐ Yes - run OE2.WK1 OR OE3.WK1 for Venn diagram, hor. & vert.

☒ Final recommendation CONCUR WITH COMMENT

FIGURE 32. PARAGRAPH 26 a. (1) EXAMPLE GROUND.WK1 PRINTOUT

AIRSPACE NUMBER:

LOCATION:

DATE: 14-Apr-93

FAA SITE: -----

Lat N 34 5 18  
Lon W 117 8 15

Protected frequency 127.0 MHz  
Antenna height AMSL 1590.0 ft

PROPOSER: PROP -----

Lat N 34 5 16  
Lon W 117 8 16

Radiated Power 0.1 Kw  
Frequency 155.3 MHz  
Antenna height AMSL 1595.0 ft

Slant Distance: Da = 219.0 ft  
Theta 1.3 deg

EIRP - Effective Radiated Power of the proponent.  
EIRP -  $10 \log (\text{power in Kw}) + 62.2$  50.0 dBm

Lr - Receiver system on frequency losses.  
Use 3 dB if actual value unknown. 3.0 dB

La - Typical ground/air antenna loss.  
Select VHF or UHF graph from menu. 2.0 dB

Lp - Polarization loss between the victim and  
broadcast antennas. If the broadcast  
antenna is horizontally polarized, Lp = 16 dB,  
for vert or circular polarization, Lp = 0 dB. 0.0 dB

Ld - Antenna vertical directivity. This term  
requires antenna pattern data from the  
proponent. E = relative E-field at vertical  
Theta from above. If unknown, enter E = 1.  
Ld -  $10 \log (E)^2$  E = 1 0.0 dB

Sr - FCC spurious emission tolerance. Enter the  
lesser: 80 dB for FM, 60 dB for TV, or  
43 + 10 log ERP in watts = 60.8 60.8 dB

Lv - Free space transmission loss at the victim  
receive frequency.  
Lv =  $20 \log (\text{freq. in MHz} \times \text{Da in ft}) - 37$  51.9 dB

Li - Free space transmission loss at the  
frequency of the interfering station. 53.6 dB

IN-BAND RADIATION (must be less than -104 dBm)  
EIRP - Lv - Ld - Lp - Lr - Sr -----> -65.7 dBm

OUT-OF-BAND RADIATION (must be less than -4 dBm)  
EIRP - Li - Ld - Lp - Lr - La -----> -8.6 dBm

(2) **The - 8.6 dBm level** was below the -4 dBm maximum level. However, the possibility of -10 dBm and -30 dBm IM levels overlapping at the site needs to be checked.

(3) **The IM program was run.** The PROP frequency of 155.25 MHz was added in the edit mode before it was run. See figure 33 for the configuration.

**FIGURE 33. PARAGRAPH 26 a. (3) EXAMPLE OF IM PROGRAM CONFIGURATION**

Source	Type	Invol	Cons	Radius nmi
GMF	TX	yes	yes	12
PND	TX	yes	yes	12
AM	TX	yes	yes	2
FM	TX	yes	yes	30
TV	TX	yes	yes	10
CAN	TX	no	no	2
Path/Filename				
GMF	\GMF\			
PND	\PND\			
AM	\FCC\AM\			
FM	\FCC\FM\			
TV	\FCC\TV\			
CAN	\CAN\			

(4) **In this case**, the IM complete report was blank, indicating there were no IM's within the selected range. See figure 34.

**FIGURE 34. PARAGRAPH 26 a. (4) EXAMPLE OF IM PROGRAM PRINTOUT**

Complete Intermodulation Analysis Report				
2H=2f1	2S30=2f1-f2	2S50=3f1-2f2	2S70=4f1-3f2	
3H=3f1	3S30= f1-f2+f3	3S50=2f1-2f2+f3	3S70=4f1-2f2+f3	
Receiver Frequency	<- - f1	Transmitter Frequencies f2	- - > f3	By-Product Frequency Type

(5) **Had there been** IM's, the CIRCLE report would have to have been run. An area of one-half mile radius would need to be checked. If any IM overlaps occurred in this area, a Venn diagram would be required to determine whether the -10 dBm and -30 dBm contours of the subject sources would overlap the site. In this unlikely event, a "non-concur" would have to be

given.

**b. If the exact distance is known,** the actual loss can be calculated from the modified free space formula found in paragraph 10 b., section 1, of this appendix. Using this formula, the actual loss in dB can be determined. With the PROP EIRP in dBm, the loss can be subtracted and the result in dBm can be compared to the -10 dBm and the -30 dBm limits for ground receivers. This will quickly determine whether the PROP's two critical contours would overlap with any other nearby FAA or broadcast critical contours which would predict RFI at the FAA ground site.